REMARKS

Applicants have amended claim 1, to correct a typographical and antecedent basis error and not in response to the Examiners rejection of claim 1. Applicants request entry of amended claim 1 in order to put the claims in better form for Appeal.

Applicants point out that the Examiner has failed to examine claim 4. Applicants do not know if the Examiner meant to reject or allow claim 4 based on Applicants arguments of December 5, 2006. Applicants request a examination of claim 4.

The Examiner rejected claims 1, 7-15 and 31-33 under 35 U.S.C. §103(a) as being unpatentable over Kobayashi (EP 0 886 308 A2) in view of Senzaki (US 2006005106A1).

The Examiner rejected claim 34 under 35 U.S.C. §103(b) as being unpatentable over Kobayashi (EP 0 886 308 A2) in view of Senzaki (US 2006005106A1) and in further view of Park (US006962873B1).

The Examiner rejected claims 35-38 under 35 U.S.C. §103(a) as being unpatentable over Kobayashi (EP 0 886 308 A2) in view of Senzaki (US 2006005106A1) and in further view of McFadden (US 6610615B1).

The Examiner rejected claim 6 under 35 U.S.C. §103(a) as being unpatentable over Kobayashi (EP 0 886 308 A2) in view of McFadden (US 6610615B1).

Applicants respectfully traverse the §103 rejections with the following arguments.

35 USC § 103 Rejections

As to claim 1, Applicants point out that:

(1) There is only one chamber taught in Kobayashi.

(2) Kobayashi clearly indicates in col. 11, lines 22-26 that the plasma is generated between grid electrode 105 and substrate 102 which are in the same chamber 101 as the silicon dioxide layer.

(3) Senzaki generates a nitrogen plasma in a second chamber.

(4) Senzaki is nitriding an in situ ALD hafnium silicate layer while Kobayashi is nitriding an already formed silicon dioxide layer.

First, Applicants point out that there is no second inlet port to chamber 101 taught in Kobayashi. FIG. 10 of Kobayashi shows only a single input port. There is no second inlet port taught in Senzaki. FIGs. 1 and 4 of Senzaki show only a single inlet port to Senzaki ALD chamber 400. Paragraph [0016] of Senzaki does not teach there is a second inlet port into ALD chamber 400 for a purge gas. Paragraph [0016] only states "excess first reactant is evacuated from the reaction chamber with the aid of a purge gas." The Examiner has assumed the existence of a second inlet port with out any proof of its existence. Applicants point out that a purge gas may be supplied from inert gas source 405 to plasma generator chamber 403 and thence to the single inlet port to chamber ALD chamber 400.

Further, the purge gas is used in the process to form the hafnium silicate layer of Senzaki not in the nitridation process. Since Kobayashi nitrides an already existing silicon dioxide film, there is no need for a purge gas at all no less a second inlet port in Kobayashi.

Second, Applicants maintain that replacing the filament plasma source of Kobayashi with the remote plasma source of Senzaki will destroy the function (not result in the same nitridation profile) of Kobayashi. Kobayashi teaches in FIG. 9, a nitridation profile where the nitrogen concentration increases with increasing distance from the surface of the silicon dioxide, while Senzaki teaches in FIGs 2 and 3 a nitridation profile where the nitrogen concentration decreases with increasing distance from the surface of the hafnium silicate. A person of ordinary skill in the art would know that the nitridation profile is a function of not only the type of plasma source but other variables such as the temperature of the layer to be nitrided, nitrogen species type and concentration in the plasma, pressure of the plasma, power level of the plasma, plasma temperatures and nitrogen source gas and inert gas flow rates to name a few. For example, Kobayashi requires a plasma pressure of 0.015 torr (col. 6, line 32), while Senzaki requires a plasma pressure of about 5 torr (paragraph [0029] and Table I). A person of ordinary skill in the art would have to perform an undue amount of experimentation (and with no certainty of success) to determine what if any combination of variables would be required to replace the filament plasma source of Kobayashi with the remote plasma source of Senzaki and still obtain the nitridation profile of Kobayashi.

Third, Applicants maintain that the rejection is improper because there is no suggestion in the prior art to combine the references as required by *Karsten Mfg. Corp. v. Cleveland Gulf Co.*, 242 F.3d 1376, 1385, 58 U.S.P,Q.2d 1286, 1293 (Fed. Cir. 2001) which states " In holding an invention obvious in view of a combination of references, there must be some suggestion, motivation, or teaching in the prior art that would have led a person of ordinary skill in the art to select the references and combine them in the way that would produce the claimed invention." The alleged motivation "to modify Kobayashi by using the remote nitridizing system as

described by Senzaki as it was commercially available at the time of the instant invention rather than spend research time and money developing Previously Presented equipment" does originate from prior art but has been supplied by the Examiner. Therefore, the Examiner has not established his prima facie case of obviousness.

Fourth, *C.R. Bard, Inc.* v. M3 Sys., Inc, 157 F.3d 1340, 1352, 48 U.S.P.Q.2d 1225, 1232 (Fed. Cur. 1998) which state "no prior art provided a teaching, suggestion or motivation that a needle assembly should be made with the structure shown and claimed in the '056 patent", and stating that { a showing of a suggestion, teaching, or motivation to combine the prior art references is an 'essential evidentiary component of an obviousness holding'." Applicants cannot find any teaching, suggestion or incentive for combining Kobayashi with Senzaki. Absent such showing in the prior art, Applicants contend that the Examiner has impermissibly used the Applicants' teaching to hunt through the prior art for the claimed elements and combine them as claimed in violation of *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed Cir. 1991) which states "the suggestion and reasonable expectation of success must be founded in the prior art, not in the applicant's disclosure."; *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed Cir. 1990) and *In re Laskowski*, 871, 910 F.2d 115, 117, 10 USPQ2d 1397, 1398 (Fed. Cir. 1989).

Based on the preceding arguments, Applicants respectfully maintain that claim 1 is not unpatentable over Kobayashi in view of Senzaki and is in condition for allowance. Since claims 4, 7-15 and 31-38 depend from claim 1, Applicants respectfully maintain that claims 4, 7-15 and 31-38 are likewise in condition for allowance.

Applicants contend that claim 13 is not obvious in view of Kobayashi in view of Senzaki because Kobayashi in view of Senzaki does not teach or suggest every feature of claim 13. For

example, Kobayashi in view of Senzaki does not teach or suggest "wherein said silicon oxynitride layer has a thickness of about 0 to 35% greater than the thickness of said silicon dioxide layer." The Examiner states that "Kobayashi is silent as to the growth of the silicon oxynitride as to the silicon oxide layer, but teaches the resultant oxynitride layer cannot be made greater than a certain level (column 1 lines 56-57). Further, Kobayashi teaches the nitrogen to be incorporated into the silicon oxide film, but does not teach or suggest any thickness growth, only control of the resulting thickness. Thus without evidence to the contrary, Kobayashi suggests a growth of 0-35%."

Applicants respectfully point out that col. 1, lines 56-57 state "According to conventionally practiced thermal oxynitridation...however the method involved the problem that the thickness of a formed oxynitride film can not be made greater than a certain level." This is simply a statement of a problem in a method different from that of Kobayashi and a person of ordinary skill in the art cannot draw the prima facie conclusion that Kobayashi suggests any increase in thickness of the layer of silicon dioxide that incorporates nitrogen, particularly when the Examiner admits Kobayashi does not teach the limitation of claim 13. Applicants believe the Examiner has impermissibly shifted the burden of proof of prima facie obviousness to the Applicants.

Based on the preceding arguments, Applicants respectfully maintain that claim 13 is not unpatentable over Kobayashi in view of Senzaki and is in condition for allowance.

Applicants contend that claim 14 is not obvious in view of Kobayashi in view of Senzaki because Kobayashi in view of Senzaki does not teach or suggest every feature of claim 14. For example, Kobayashi does not teach or suggest "wherein the mean thickness of said silicon

oxynitride layer varies by no more than about one-half angstrom sigma from a center to an edge of said substrate." The Examiner states that "Kobayashi is silent as to the thickness of the resulting layer's mean thickness varying by no more than 0.5 angstrom sigma from a center to an edge of the substrate. However, Kobayashi teaches the method (which is identical to that of the instant claims) for improved control of the resultant film. Thus without evidence to the contrary, the method of Kobayashi will result in the mean thickness varying by no more than 0.5 angstrom sigma from a center to an edge of the substrate."

First, Applicants, in Table I, have provided uniformity data that is lacking in Kobayashi. A person of ordinary skill in the art would expect if, the method of Kobayashi could provide the uniformity in Applicants claim 14, Kobayashi would have provided data as Applicants have, particularly in light of the multiplicity of tables of data relating to process conditions that Kobayashi provides. Applicants take these to facts as providing evidence to the contrary.

Second Applicants respectfully contend that the method Kobayashi and the Applicants method are different. For example, Kobayashi uses a tungsten filament to generate a plasma in a single chamber right over the substrate, while Applicants generate a plasma by RF excitation in a chamber away from the chamber the substrate is in. Kobayashi heats the wafers with UV, Applicants use a thermal chuck. Any person of ordinary skill in the art would know that the apparatus of Kobayashi absolutely cannot duplicate the Applicants process.

Third, the Examiner admits Kobayashi does not teach the limitation of Applicants claim 14 and has argued prima facie obviousness without compelling evidence and in doing so has impermissibly shifted the burden of proof of prima facie obviousness to the Applicants.

Based on the preceding arguments, Applicants respectfully maintain that claim 14 is not unpatentable over Kobayashi in view of Senzaki and is in condition for allowance.

Applicants contend that claim 15 is not obvious in view of Kobayashi in view of Senzaki because Kobayashi in view of Senzaki does not teach or suggest every feature of claim 15. For example, Kobayashi in view of Senzaki does not teach or suggest "wherein the nitrogen concentration of said silicon oxynitride layer varies by not more than about 25% from a center to an edge of said substrate." The Examiner states that "Kobayashi is silent as to the nitrogen concentration not varying by more than 25% from a center to an edge of the substrate. However, Kobayashi teaches the method (which is identical to that of the instant claims) for improved control of the resultant film. Also, Kobayashi teaches a concentration gradient only with the depth of the thickness, suggesting a uniform concentration along the surface. Thus without evidence to the contrary, the method of Kobayashi will result in the mean thickness varying by no more than 0.5 angstrom sigma from a center to an edge of the substrate."

First Applicants respectfully contend that the method Kobayashi and the Applicants method are different. For example, Kobayashi uses a tungsten filament to generate a plasma in a single chamber right over the substrate, while Applicants generate a plasma by RF excitation in a chamber away from the chamber the substrate is in. Kobayashi heats the wafers with UV, Applicants use thermal chuck. The apparatus of Kobayashi absolutely cannot duplicate Applicants process

Second, the Examiner admits Kobayashi does not teach the limitation of Applicants claim 15 and has argued prima facie obviousness without compelling evidence and in doing so has impermissibly shifted the burden of proof of prima facie obviousness to the Applicants.

Based on the preceding arguments, Applicants respectfully maintain that claim 15 is not unpatentable over Kobayashi in view of Senzaki and is in condition for allowance.

As to claim 34, Applicants point out that Applicants are claiming the reducing gas is hydrogen, **not** a mixture of hydrogen and nitrogen, so the Examiners discussion that substituting nitrogen and hydrogen for ammonia is not relevant.

As to claim 35, Applicants believe the arguments present *supra* with respect to claim 1 are applicable to claim 35.

Further, the Examiners has stated that "Kobayashi teaches that the gases may react singly or in combination (column 10, lines 36-39) suggesting that there is no resultant product change dependent upon whether the gasses are placed in the chamber through single inlet or multiple inlets." Applicants point out they are claiming "transferring the nitridation species...through said first inlet port" and "introducing a neutral gas... through said second inlet port."

One of ordinary skill in the art would know that introducing the reducing gas through a separate port and not subjecting it to excitation in the remote plasma source precludes any possibility of exciting the reducing gas and is thus a method limitation. Kobayashi in column 10, lines 36-39 not only does not support the Examiners allegation that "that there is no resultant product change dependent upon whether the gasses are placed in the chamber" but also is incorrect in light of Senzaki which will cause a change in the gas species that are reacting with the surface by necessarily generating ionized reducing gas species in the remote plasma chamber which will be swept into the ALD chamber along with the nitridation species. An ionized or free radical species will react differently than a neutral species.

Based on the preceding arguments, Applicants respectfully maintain that claim 35 is not unpatentable over Kobayashi in view of Senzaki and in further view of McFadden and is in condition for allowance.

As to claim 6, Applicants find no relevance in the Examiner reason to combine references , to wit "helium has a lower ionization energy." The abstract of McFadden actually states "A gas having a lower ionization energy than nitrogen, such as for example, helium, maybe used in combination with nitrogen to produce a lower power plasma resulting in a **steeper** concentration curve for nitrogen in the silicon oxide film." Kobayashi teaches in FIG. 9, a nitridation profile where the nitrogen concentration increases with increasing distance from the surface of the silicon dioxide, while McFadden teaches in FIG 1, a nitridation profile where the nitrogen concentration decreases with increasing distance from the surface of the hafnium silicate. Thus the function of Kobayashi is further destroyed (see arguments in reference to claim 1) by combing McFadden with Kobayashi and Senzaki.

Based on the preceding arguments, Applicants respectfully maintain that claim 6 is not unpatentable over Kobayashi in view of McFadden and is in condition for allowance

CONCLUSION

Based on the preceding arguments, Applicants respectfully believe that all pending claims and the entire application meet the acceptance criteria for allowance and therefore request favorable action. If Examiner believes that anything further would be helpful to place the application in better condition for allowance, Applicants invite the Examiner to contact the Applicants' representative at the telephone number listed below. The Director is hereby authorized to charge and/or credit Deposit Account 09-0456.

Respectfully submitted,
FOR:
Burnham et al.

Dated: 05/24/2006

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